

Photometry and Surface Physical Properties of Comet 19P/Borrelly

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The successful Deep Space 1 flyby of Comet P/19 Borrelly offered an unprecedented opportunity to perform disk-resolved photometry and photometric modeling of a comet's nucleus. The flyby occurred at a favorable ground-based apparition, enabling concomitant telescopic observations that provided both the "big picture" in time and space and observations at photometric viewing geometries not attained by the spacecraft. The solar phase angle of the encounter period changed from 87 to 52 degrees over a period of 1.5 hours; this range is ideal for determining the macroscopic roughness of the comet's surface. The microphysical texture of the surface is best determined by ground based observations at aphelion and near opposition. The combination of both disk resolved measurements from DS1 and disk integrated measurements from both DS1 and the ground permits a constrained set of photometric parameters to be derived.

Preliminary analysis of the global geometric albedo yields a value at V wavelengths (550 nm) between 0.031 ± 0.005 (for a Mathilde-type solar phase curve at phase angles less than 10 degrees) and 0.042 ± 0.005 (for an average C-type phase curve). Albedo variegations of at least a factor of two exist on Borrelly's surface: Its light curve amplitude of nearly a magnitude may thus not be due to shape alone. The image resolution of ~ 60 m allows mapping of albedo variegations in terms of active jet morphology.

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